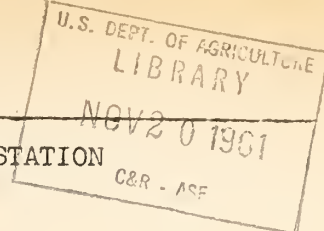


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SEASON, DATE, AND DEPTH OF PLANTING CRESTED WHEATGRASS AND
OTHER GRASSES AT LOWER ELEVATIONS IN NORTHERN NEVADA

By Joseph H. Robertson, Forest Ecologist

SUMMARY

Fall seeding after October 15 can be expected to give better results than can seeding before that date at lower elevations for which adapted grasses are available, but where early fall precipitation is erratic. Under such conditions and where snow cover is intermittent, early spring planting in northern Nevada is likely to be as good as any fall planting. Early fall and late spring plantings are unreliable because seed deteriorates in the ground under conditions of wetting and drying that are unfavorable for rapid seedling emergence and establishment.

Seedling emergence is influenced by small variations in depth of planting. Crested wheatgrass, and probably most mixtures containing it as a base, should be planted one-half inch deep if the soil is a loam. Certain other investigators have suggested that lighter soils require deeper planting. The 1-inch depth is better for tall oatgrass while bluebunch wheatgrass does equally well at one-half and 1 inch.

To obtain good stands from plantings made at other dates or depths than optimum, the seeding rate must be increased. These conclusions have grown out of studies conducted at elevations of 4,400 to 5,200 feet in northern Nevada since 1939.

The Problem

Experience in the Intermountain region has shown that success in range re-seeding usually depends on soil moisture which in turn is closely related to elevation. On ascending any of the mountain ranges of the region until moderate elevations are passed, an increasing number of species is found to be adapted to artificial reseedling and their establishment is easier than at lower levels. There seems also to be more latitude as to season of planting until temperature alters this rule at high elevations.

Because fewer species proved adapted and establishment was so difficult at lower elevations, more detailed studies were begun in 1939 to learn the best date and depth for seeding. Continued low success from fall plantings led to inclusion of spring dates in the studies in 1942. Elevations from 5,200 feet on the foothills of the Santa Rosa Mountains down to 4,400 feet in Paradise Valley, Nevada, all in the big sagebrush type, were included at that time.

Inasmuch as this part of Nevada receives little or no effective summer rainfall, conditions for survival of grass seedlings are most critical toward the end of the summer. For this reason only June-August precipitation for the period 1940 to 1945 is tabulated here.

Table 1. Summer precipitation during the years of this study at two stations 5 miles apart.

Station	Elevation	Inches of precipitation						
		Normal	1940	1941	1942	1943	1944	1945
Santa Rosa Substation	5,200	-	1.97	5.53	.95	1.80	2.29	2.45
Paradise Valley Ranger Station	4,650	1.71	.80	2.55	.41	1.49	2.02	3.09

From these data we see that the 550-foot increase in elevation was associated with a 44 percent higher rainfall, or .25 inch more per month during the summer. It is well to note that half of the summers were drier than normal.

The Studies

Beginning in 1939, 100 live seeds of three species were planted in duplicate randomized rows at two depths each 2 weeks from mid-September to mid-November for 4 years. Rows were spaced at 12 inches. This is equivalent, in the case of crested wheatgrass, to 2 pounds per acre.

Table 2. Responses of three grasses to the fall tests.

	Crested wheatgrass	Bluebunch wheatgrass	Tall oatgrass
Av. seedlings in percent of seed	18	7	8
Av. established plants in % of seed ^{1/}	9	5	2
Av. survival plants in % of seedlings ^{2/}	53	52	58
Total emergence from best date ^{3/}	370	231	212
Total survival from best date	232	164	145
Total emergence from worst date	202	115	62
Total survival from worst date	102	40	33
Better fall planting depth ^{4/}	1/2"	1/2"-1"	1"
Total emergence from better depth	846	446	322
Total survival from better depth	473	227	218
Total emergence from worst depth	588	300	320
Total survival from worst depth	271	169	151

^{1/} Plants surviving 2 years were considered established.

^{2/} Decimals of first three rows rounded off after computation.

^{3/} Planting was at intervals of 2 weeks, Sept. 15 to Nov. 15^{Nov. 15} was the best, Sept. 30 the least favorable average seeding date for all species.

^{4/} Two mechanically controlled depths were tested, 1/2" and 1".

The data indicate that 2.3 times as much seed was needed on the worst date to give as many 2-year-old crested wheatgrass plants as obtained from planting on the best date. The worst depth required 75 percent more crested wheatgrass seed for a total survival equal to the best depth. Only one-fourth as much seed is needed when seeding is done on the best date and depth combined as for the poorest date and depth tested. The importance of this relationship is seen when it is considered in terms of cost and stand.

Indications by 1941 were that the better stands were from late fall seeding so a study was initiated to compare the October 30 and November 15 planting dates with two early spring dates. The data for this part of the study are in table 3. The earliest planting was made as soon as the ground was bare of snow and slightly dry at the surface, the second being 2 weeks later. These two dates were about April 1 and April 15 of 1942 and 1943. This study was otherwise similar to that summarized in table 2 but ran only two planting years, the summers of which were drier than average as shown in table 1.

Table 3. Results of two comparable spring and fall plantings of 32 8-foot rows.

	Crested wheatgrass	Bluebunch wheatgrass	Tall oatgrass
Total viable seeds sown	3,200	3,200	3,200
Total seedlings emerged	865	728	648
Av. seedlings in percent of seed	27	23	20
Total established plants after 2 years	536	475	277
Av. established plants in % of seed	17	15	9
Av. established plants in % of seedlings	62	65	43
Total emergence from spring plantings	471	506	465
Total survival from spring plantings	258	331	169
Total emergence from fall plantings	394	222	183
Total survival from fall plantings	278	144	108

Survival from mid-April plantings was 89 percent of that from those of April 1. Results have been poor from miscellaneous plantings made after April 15 in this area.

But what becomes of seed planted at the wrong time? In seeking the answer to this question, two dozen 2"x2" cheesecloth sacks containing 100 seeds each were buried one-half inch deep on tilled land, half in May, and half in July. They were dug up, examined, and germinated in July, August, September, and October. Average mortality of crested wheatgrass was 43 percent; of bluebunch wheatgrass seed 49 percent. Interrupted germination when the surface dried too quickly after storms appeared to be the cause of most mortality. Once their germination was halted, seeds always refused to resume growth in the laboratory. High soil temperature was not an evident factor since no deterioration of seed was found in dry soil.

Following the leads from the studies reported above, tests of late fall and early spring plantings were extended until 78 comparisons were available for an aggregate of 40 species. Each comparison is based on paired plots planted by the same method to the same lot and amount of seed late in the fall and early in the next spring. These results are presented in table 4.

Table 4. Average numbers of plants per 100 feet of row as counted in 1945.

	Date of planting							
	1942	1943	1943	1944	1944	1945	All years	
	Fall	Spring	Fall	Spring	Fall	Spring	Fall	Spring
Grasses	38	32	43	60	72	100	51	64
Weeds and browse	22	15	37	55	-	-	29	35
Crested wheatgrass	25	90	82	95	62	65	56	83
Intermediate "	-	-	130	175	110	112	120	143
Bluebunch "	12	57	43	66	42	40	32	54
Bluestem "	-	-	20	40	30	31	25	35

These results continue to indicate that spring planting before April 15 in northern Nevada and climatically similar areas can be expected to give stands equal to or better than those obtained from fall plantings.

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